

Habitat Evaluation Procedures (HEP) Report

Burlington Bottoms

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BURLINGTON BOTTOMS HABITAT EVALUATION

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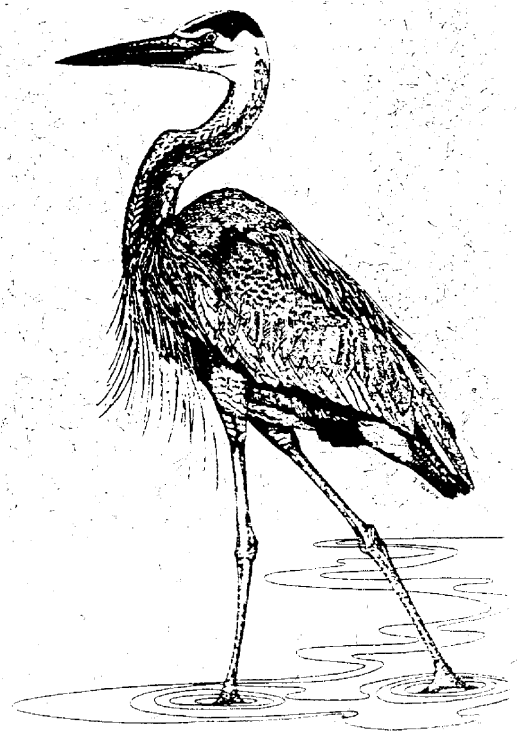
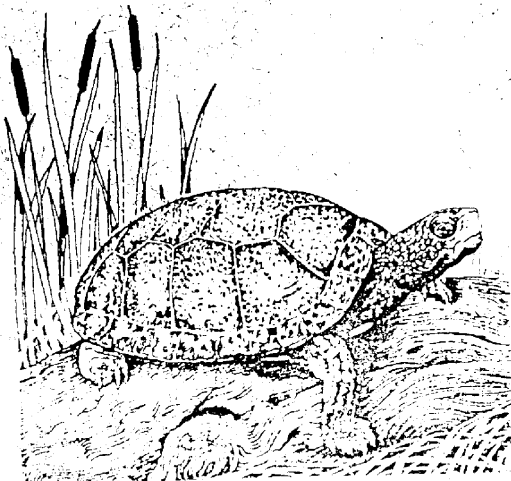


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BURLINGTON BOTTOMS HABITAT EVALUATION

1 INTRODUCTION

Burlington Bottoms, consisting of approximately 417 acres of riparian and wetland habitat, was purchased by the Bonneville Power Administration in November 1991. The site is located approximately 1/2 mile north of the Sauvie Island Bridge (T2N R1W Sections 20, 21), and is bound on the east side by Multnomah Channel and on the west side by the Burlington Northern Railroad right-of-way and U.S. Highway 30 (Figures 1 and 2).

Wildlife habitat values resulting from the purchase of this site will contribute toward the goal of mitigating for habitat lost as outlined in the Columbia and Willamette River Basin's Fish and Wildlife Program and Amendments. Under this Program, mitigation goals were developed as a result of the loss of wildlife habitat due to the development and operation of Federal hydro-electric facilities in the Columbia and Willamette River Basins.

In 1993, an interdisciplinary team was formed to develop and implement quantitative Habitat Evaluation Procedures (HEP) to document the value of various habitats at Burlington Bottoms. HEP participants included; Charlie Craig, BPA; Pat Wright, Larry Rasmussen, and Ron Garst, U. S. Fish and Wildlife Service; John Christy, The Nature Conservancy; and Doug Cottam, Sue Beilke, and Brad Rawls, Oregon Department of Fish and Wildlife.

Results of the HEP will be used to; 1) determine the current status and habitat enhancement potential of the site consistent with wildlife mitigation goals and objectives; and 2) develop a management plan for the area.

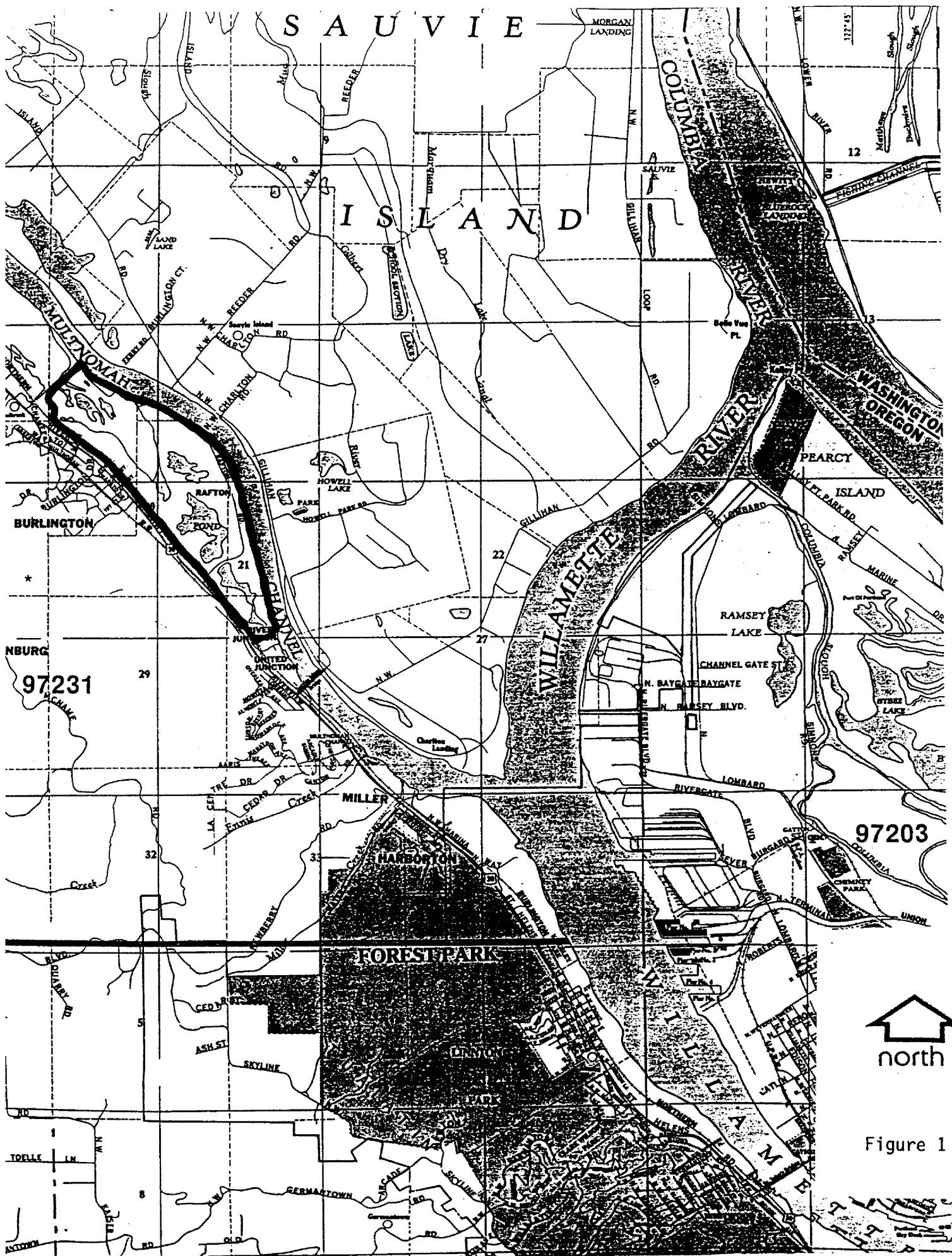
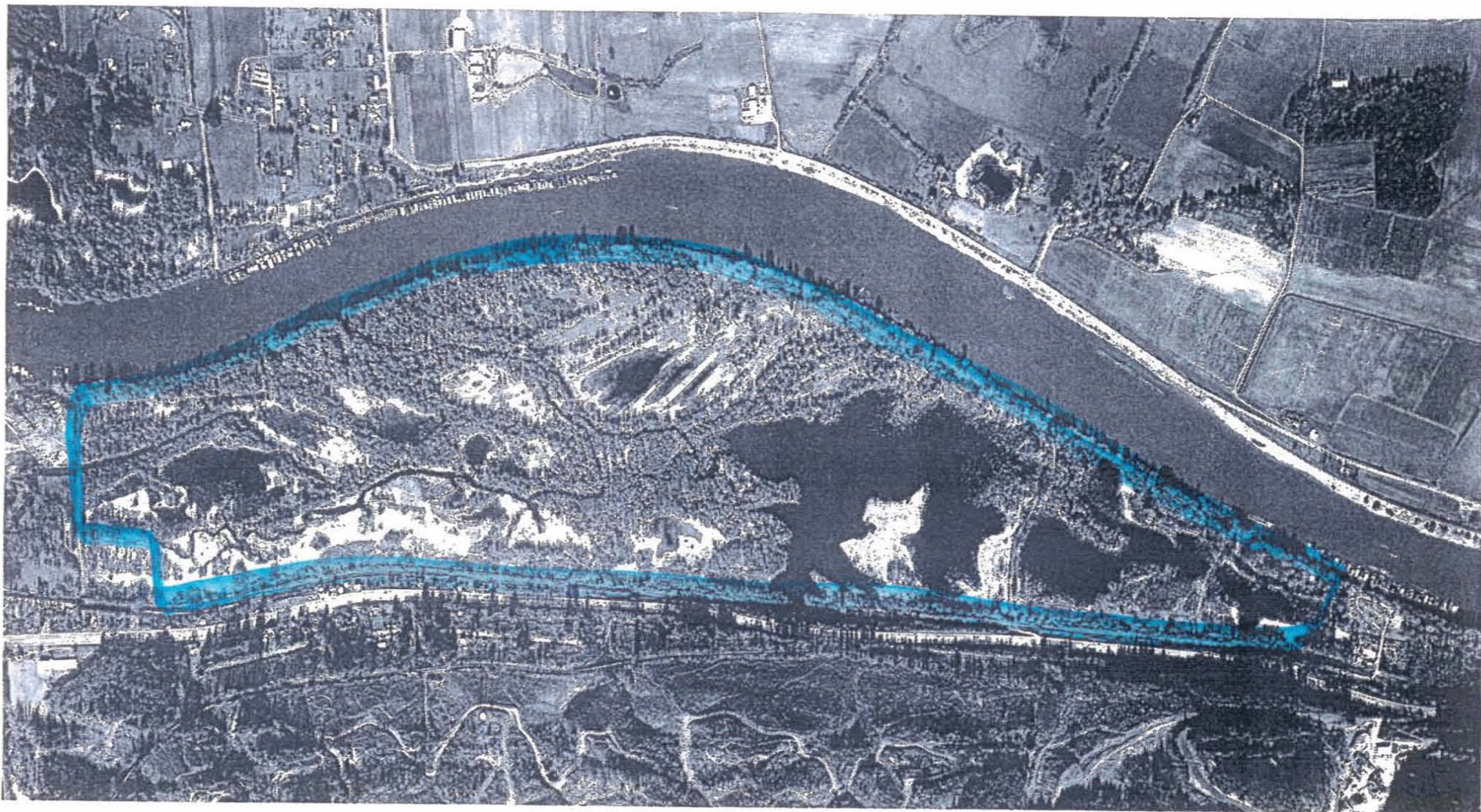


Figure 1



BURLINGTON BOTTOMS 3/93

2 HISTORICAL BACKGROUND

Historical uses of the site include leased grazing of cattle from 1941 until November 1991. A barn for hay storage was located at the southwest end of the site, adjacent to the railroad tracks. Remnants of the barn still remain. Swine were also kept on the property, specific dates are unknown.

From the late 1930's until the late 1960's, the property was leased for use as a logdump, which was located on the east side along Multnomah Channel. A fill embankment was constructed, date unknown, along the Channel which has had a significant impact on the hydrology of the area (see "Final Report - Hydrology and Hydraulics Assessment for Burlington Bottoms", Oregon Dept. of Fish and Wildlife.) This operation included a roundhouse, which was used to turn locomotive engines around that brought in carloads of logs and to service the train engines. Concrete foundations and other evidence of the logdump operation can still be found in the area. "Rafton Tract" was the name used historically for Burlington Bottoms. Access to the logdump operation was via a road which runs through the middle of the property; this road was historically called "Rafton Road".

Prior to the construction of the Sauvie Island bridge in the early 1950's, a ferry operated between the north end of Burlington Bottoms and Sauvie Island. To transport people from the ferry to U.S. Highway 30, a road built on pilings ran across the north end of Burlington Bottoms. This road no longer exists, but the placement of some of the pilings is evident in certain areas, and can be seen on historical photos.

Several houseboats were present along the east side of the property on Multnomah Channel, but were removed in the early 1980's. Evidence of former activities, including pilings, timber piles, cabling, scrap metal, steel banding, and several abandoned sheds and boat ramps can be found along the west bank of Multnomah Channel.

Historically, the wetlands in the southern portion of Burlington Bottoms have been referred to as "Wapato Marsh". Populations of the wapato plant, which was an important food source for local Native Americans, can be found in many of the wetlands scattered throughout the area.

3 SITE DESCRIPTION

The Burlington Bottoms area is a mosaic of wetland and riparian communities and is remnant of a once more prevalent system along the Willamette and Columbia Rivers.

Wildlife diversity is high and includes many species of waterfowl, songbirds, raptors, mammals, fish, reptiles, and amphibians. Elevation ranges from approximately 10.0 to 35.5 feet. Prior to flood control, the area was annually inundated by both the Willamette and Columbia Rivers.

Burlington Bottoms is characterized by 6 major habitat types: riparian tree (215.32 ac), riparian shrub (14.10 ac), forested wetland (16.24 ac), wet pasture (49.96 ac), emergent wetland (seasonally flooded ponds and marshes) (82.19 ac) and open water (25.00 ac). Total acreage for all habitat types is approximately 417 acres (Figure 3).

Also present are approximately 14.19 acres (included in the total of 417 ac) of disturbed areas associated with previous human activities. These areas are found under the powerline, along the embankment next to Multnomah Channel, along the road through the middle of the site, and along the east side of the Burlington Northern Railroad tracks.

Vegetation in many areas consists of predominantly non-native species such as Himalaya blackberry (Rubus discolor), Scot's broom (Cytisus scoparius), and Reed canary grass (Phalaris arundinacea). Old roadbeds (gravel and/or blacktop) still exist in some of these disturbed areas. The disturbed areas were not included in the habitat analysis.

Riparian Tree - (215.32 ac) This habitat type is found throughout the site, located along the channels and interspersed between the numerous lakes and ponds. It is defined by plants of the following species with dominant trees being over 15 ft in height. Oregon ash (Fraxinus latifolia) and Black cottonwood (Populus trichocarpa) are the dominant tree species, Red alder (Lanes rubra) is also present in some areas. Shrub species include Creek dogwood (Cornish stolonifera), Pacific willow (Salix lasiandra), Red elderberry (Sambucus racemose), Douglas spiraea (Spiraea douglasii), and Snowberry (Symphoricarpos albums). Lady fern (Athyrium filix-femina), Stinging nettle (Urtica diocesan), and Common horsetail (Equisetum arvense), are some of the herbs found in this habitat. Grasses and sedges include Dewiest sedge (Carex deweyana), and Reed canary grass (see Appendix B for complete plant list).

Forested Wetland - (16.24 ac) The forested wetland habitat is characterized by woody vegetation \geq 20 ft in height, is seasonally flooded, has an overstory of trees, an understory of young trees or shrubs, and a herbaceous layer. Oregon ash and Black cottonwood dominate this habitat type.

Shrub species that are most common in the forested wetland include Creek dogwood, Red elderberry, Snowberry, and Sitka willow (Salix sketchiness). Plants in the herbaceous layer include Common horsetail (Equisetum arvense), and Licorice fern (Polypodium glycyrrhiza). Grasses and sedges present are Dewiest sedge and Reed canary grass.

Riparian Shrub - (14.10 ac) Species of shrub found in this habitat include Pacific willow, Sitka willow, Red elderberry, Douglas spiraea, and Himalaya blackberry. This habitat is characterized by dominant vegetation under 15 ft in height. Shrub habitat is found at the edges of stands of ash or cottonwood or is interspersed among the numerous lakes, ponds, and channels.

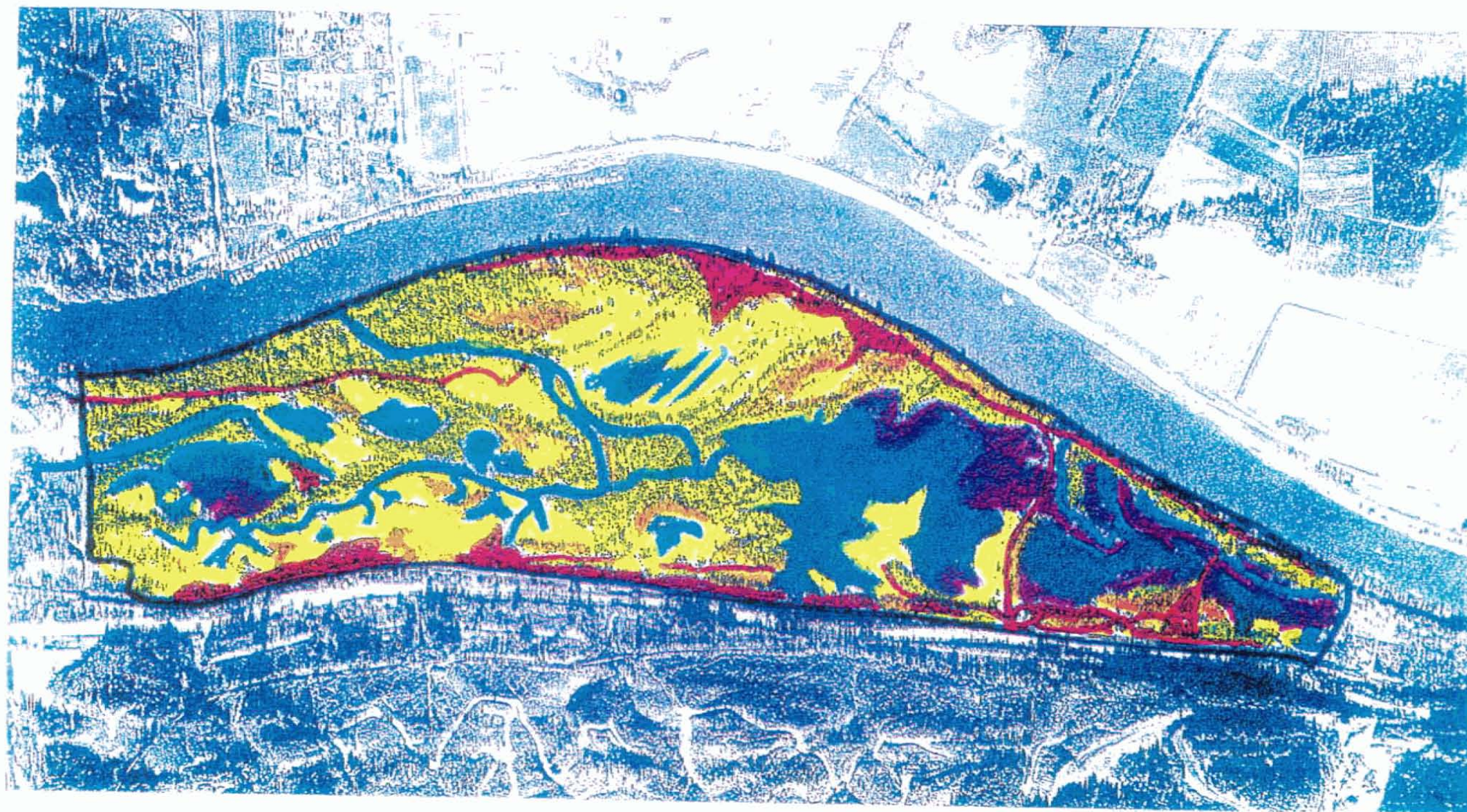
Emergent Wetland - (82.19 ac) This habitat is characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. It can be found at the edges of the lakes, ponds, and backwater channels, and covers a large portion of Burlington Bottoms. Herbs found in the wetlands include Duckweed (Lemna minor), Water smartweed (Polygonum amphibium), Reed canary grass, and Wapato (Sagittaria latifolia). Wapato is one of the predominant herbs in several of the ponds at Burlington. The wetlands in the southern portion of the site have been referred to historically as "Wapato Marsh". Ovoid spikerush (Eleocharis ovata), Creeping spikerush (Eleocharis balusters), Soft rush (Juncus effusus), and Reed canary grass compromise some of the grass and sedge components found in the emergent wetland habitat. Reed canary grass is the predominant grass along the fringes of some of the ponds and marshes, and appears to be rapidly invading many areas.

Open Water - (25.00 ac) Open water habitat can be found in the numerous lakes, ponds, and channels scattered throughout the site. Water depth varies seasonally and ranges from 0.1 to 5.0 feet. The largest body of water is Horseshoe Lake, located in the central portion of Burlington Bottoms. Open water levels are influenced by tidal changes, nearby river levels, beaver activity (a large beaver dam is the principal water flow control for Horseshoe Lake), and runoff from the surrounding hillsides and U.S. Highway 30.

Wet Pasture - (49.96 ac) Most of the wet pasture habitat is located in the northern and central portions of the project site. Up until 1991, cattle were grazed in the wet pasture habitat. The predominant vegetative components are comprised of non-native species, including Reed canary grass and Himalay blackberry. The Reed canary grass component is dense and quite high, in some areas up to 6ft. Surface water is present for extended periods, such as early in the growing season, but is absent by late summer in most years.

Some of the herbaceous plants present include Bull thistle (Cirsium vulgare), and Oxe-eye daisy (Chrysanthemum leucanthemum). Grasses and sedges in the wet pasture include Tall fescue (Festuca arundinacea), Meadow foxtail (Alopecurus pratensis), Columbia sedge (Carex aperta), and Reed canary grass. The Reed canary grass has invaded much of the pasture habitat, outcompeting native species. Himalaya blackberry, another non-native species, is common and appears to be spreading rapidly throughout the open areas.

BURLINGTON BOTTOMS



Habitat Types

(215.32 ac) Riparian tree		Forested wetland	(16.24 ac)
(14.10 ac) Riparian shrub		Emergent wetland	(82.19 ac)
(49.96 ac) Pasture (seasonally flooded)		Disturbed areas	(14.19 ac)

Figure 3

4 EVALUATION PROCEDURES

Habitat evaluation procedures (HEP) developed by the U.S. Fish and Wildlife Service (USFWS 1980), utilize a species/habitat approach for quantifying relative habitat values. Several wildlife species are selected for a particular area. Each species has various habitat needs that are documented in a Habitat Suitability Index (HSI) model. HSI models primarily focus on the measurement of physical and chemical habitat variables which are used to calculate an index to habitat quality. The model includes information on habitat use, model structure, assumptions, application, and references.

The habitat in a study area is compared to optimum habitat (defined in HSI model) for a species to result in a HSI. The HSI is a number between 0 and 1:

0 represents no habitat suitability

1 represents optimum habitat suitability

The HSI is multiplied by the number of acres of a particular habitat in the study area to obtain Habitat Units (HU's).

$HSI \times Acres = HU's$

1 Habitat Unit = 1 acre with optimum habitat suitability

To determine the impact of a proposed action, the existing or baseline habitat condition is compared to predicted future habitat conditions at predetermined Target Years (TY). Target Year 0 (TY0) represents baseline conditions. Target Year 1 (TY1) represents the first year land and/or water use is expected to change. Other Target Years are selected up to the completion of a proposed action or the end of the economic life of the action. For Burlington Bottoms, TY1 was based on a 10% change in habitat conditions; at TY25, 90% of the habitat conditions would have occurred; and by TY50, all of the habitat changes would have occurred.

Using the same HSI models, the area of available habitat and HSI's are estimated for each evaluation species and future Target Year. HU's are determined for each Target Year and annualized by summing HU's throughout the analysis period and dividing by the number of years in that period (in this case, 50 years). This results in Average Annual Habitat Units (AAHU). Annualization of HU's facilitates the comparison of various alternative actions for impact assessment (see Table 5).

5 SPECIES SELECTION

The HEP team selected the following species to determine the relative value of wildlife habitat at Burlington Bottoms:

1. Wood Duck (Aix sponsa)
2. Great Blue Heron (Ardea herodias)
3. Yellow Warbler (Dendroica petechia)
4. Black-capped Chickadee (Parus atricapillus)
5. Red-tailed Hawk (Buteo jamaicensis)
6. Valley Quail (Callipepla californica)
7. Beaver (Castor canadensis)
8. Spotted Sandpiper (Actitis macularia)

Criteria for species selection included priority goals developed in the Columbia River Basin Wildlife Mitigation Plan, habitat use, ecological role, and early discussions with Joe DeHerera and Robert Walker (BPA), Jim Greer and Joe Pesek (ODFW), and Pam Wiley (TNC).

A matrix was developed in the early stages of the HEP, which displayed the major habitat types, including a list of species utilizing these habitats (Table 1, page 12). After preliminary field surveys were completed, some changes in the matrix were made. The flooded pond and emergent pond habitat types were combined, as were the wet pasture and upland pasture (surveys in spring revealed that a majority of the upland pasture was wet pasture). Forested wetland was added for a total of six habitat types. From the initial species list, the final models were chosen (Table 2, page 13).

Habitat use in relation to food, reproduction, cover requirements, and season of use of candidate species was particularly important in final species selection (Table 2). Selected species ranged from having specific habitat preferences (Wood Duck) to species utilizing most of the habitat types at Burlington Bottoms (Great Blue Heron).

The species selected also represent guilds of species, such as cavity nesters (Wood Duck, Chickadee); wading birds (Great Blue Heron); shore birds (Spotted Sandpiper); riparian tree nesters (riparian trees > 15'; Great Blue Heron, Wood Duck, Black-capped Chickadee); upland game birds (Valley Quail); shrub-scrub users (Valley Quail, beaver, Yellow Warbler); wetland species (beaver, Heron, Wood Duck, Spotted Sandpiper); and open grassland users (Red-tailed Hawk and Valley Quail).

The Western pond turtle (Clemmys marmorata) was chosen to represent reptiles, but it was determined by the HEP team that the model did not adequately cover the turtle's habitat needs. It was decided that habitat requirements for the Western pond turtle would be adequately covered by the beaver, Wood Duck, Great Blue Heron, and Valley Quail models. A model for mink was considered, but it was determined that this species' habitat requirements would be covered by the beaver, Black-capped Chickadee and Great Blue Heron models.

The Red-tailed Hawk model was added to include habitat requirements for raptors that were not covered in the other models (e.g. number of trees ≥ 20 " d.b.h. per acre). All of the models used for selected species were obtained from the U.S. Fish and Wildlife Service (Table 3, page 15).

Though not chosen as target species, an approximate estimation of the total number of suitable habitat acres at Burlington Bottoms was made for each of the following species; black-tailed deer, Canada goose, and mink. All three species are considered Target Species for the Bonneville Dam Project in the lower Columbia River Basin. Since models were not used for these species, HSI calculations were not determined. For results of this estimate, see 7.1, page 27.

TABLE 1. MATRIX OF SPECIES AND HABITAT TYPES

Species	HABITAT					
	Seasonally pasture	Flooded pond	upland pasture	riparian tree	shrub	emergent pond
GB Heron	X	X	X	X		X
Yellow warbler					X	
Wood Duck		X		X	X	X
Valley Quail	X	X	X	X	X	
Beaver		X		X	X	X
Black-tl deer	X	X	X	X	X	
Red-tail Hawk	X	X	X	X		X
Mink	X	X		X	X	
W-P turtle	X	X	X		X	X
Spotted sandp.	X	X		X	X	X
B-C chicka				X		

TABLE 2. HABITAT USE OF THE EVALUATION SPECIES AT BURLINGTON BOTTOMS

SPECIES	HABITAT					
	<u>Riparian Tree</u>	<u>Riparian Shrub</u>	<u>Forested Wetland</u>	<u>Emergent Wetland</u>	<u>Wet Pasture</u>	<u>Open Water</u>
Wood Duck	RC		FRC	FC		F
Great Blue Heron	RC		FRC	F	F	F
Yellow Warbler		FRC				
Black-capped Chickadee	FRC					
Red-tailed Hawk	RC			F	F	
Valley Quail		RC			FC	
Beaver	F	F	FC	FRC		FC
Spotted Sandpiper*	FRC			FRC	RC	FRC

HABITAT USE: F = Forage, R = Reproductive, C = Cover.

Complete descriptions of each habitat type are in the Site Description section.

*See the Results and Discussion section for a description of Spotted Sandpiper habitat.

6 METHODS

Analysis of habitat cover types was accomplished using 1993 color and infrared aerial photographs at a scale of 1:500. Topographic maps were also used in the analysis. A grid system, overlaid on the aerial photographs, was used to determine the number of acres for each habitat type. Several days of field verification were necessary to ground truth the maps for all major habitat types.

Several meetings were held with the HEP field team to discuss the models chosen and determine what types of sampling methods should be used. Two additional meetings were held at the site to get everyone involved familiar with the habitat types, variables, and sampling procedures. Field data collection occurred in the months of June and July, 1993.

The data collected measures the present habitat conditions. It was agreed upon by the HEP field team that estimates of future habitat conditions with and without management would also be done in the field. Future habitat without management conditions were based on the assumption that baseline habitat conditions established from the HEP analysis would have to be maintained at a minimum, due to mitigation requirements.

Future habitat with management estimates were based on the assumption that enhancement activities (such as reducing non-native plant populations) would occur in order to improve habitat conditions. This determination would later be helpful in writing a management plan for the area.

Habitat data was collected using a total of 15 sampling sites for the HSI models for Burlington Bottoms. Transects were either 150 ft in length with sample locations spaced 25 ft apart in a linear configuration, or 192 ft in length with sample locations spaced 32 ft apart; these were used to measure some of the variables in the riparian tree, riparian shrub, and wet pasture habitat types. A quadrat (100 ft long and 40 ft wide) was used for some of the variables in the Wood Duck, beaver, Red-tailed Hawk, Valley Quail, Spotted Sandpiper, and Black-capped Chickadee models.

Measurements for the Great Blue Heron model were determined from aerial photographs taken at a scale of 1:200, and then ground truthing the results. A canoe was used to help locate the active and potential nest sites in the area.

The emergent wetland and open water habitat data (Wood Duck, beaver, and Spotted Sandpiper models), was analyzed using a planimeter, aerial photographs taken on a scale of 1:200, historical photographs, and ocular estimation in the field.

TABLE 3. HSI model variables (V) for selected Burlington Bottoms HEP species.

1. WOOD DUCK

V1 = Number of potentially suitable tree cavities per acre, with minimum entrance dimensions of 3.0 by 4.0 inches.

HSI: The number obtained becomes part of the equation for V3.

V2 = Number of nest boxes per acre.

HSI: The number obtained becomes part of the equation for V3.

V3 = Density of potential nest sites per acre.

HSI: 1.0 if ≥ 5 suitable trees per acre to 0.0 if no suitable trees exist.

V4 = Percent of the water surface covered by potential brood cover.

HSI: 1.0 if brood cover is between 50% and 75%.

V5 = Percent of water surface covered by potential winter cover.

HSI: 1.0 if winter cover is between 50% and 75%.

V6 = Distance between nest and brood cover types.

HSI: 1.0 if ≤ 0.5 mi to 0.0 if ≥ 2.0 mi.

V7 = Percent of area providing equivalent optimum nesting habitat.

HSI: 1.0 if $\geq 20\%$ to 0.0 if 0%.

V8 = Percent of area providing equivalent optimum brood habitat.

HSI: 0.0 to 1.0 from 0% to 100%.

Emergent wetland (3 sample sites), forested wetland (3 sample sites), riparian tree (3 sample sites), and open water (3 sample sites) habitats were evaluated using this model. Because the Wood Duck is considered a resident species for this area, both breeding and winter habitats were evaluated. The final HSI was determined by using the highest of the two values.

4. BLACK-CAPPED CHICKADEE

- V1 = Percent tree canopy closure.
HSI: 1.0 if between 50% and 75%.
- V2 = Average height of overstory trees.
HSI: 1.0 if ≥ 49.2 ft.
- V3 = Number of snags 4-10" dbh per acre.
HSI: 1.0 if ≥ 2 .

Riparian tree habitat (3 sample sites) was evaluated for this model. The HSI determination was based on the lowest of the two values obtained for the food and reproduction life requisites.

5. RED-TAILED HAWK

- V1 = Percent herbaceous canopy cover.
HSI: 1.0 if $\geq 65\%$.
- V2 = Percent herbaceous canopy 3-18" tall in open areas.
HSI: 1.0 if $\geq 50\%$.
- V3 = Number of perch sites (trees, poles) ≥ 10 " d.b.h. per acre in open areas.
HSI: This variable was modified so that there would be a forage value for areas without trees. 1.0 (high) if ≥ 3 trees per acre to 0.2 (low) if ≤ 1 tree per acre.
- V4 = Percent tree canopy closure.
HSI: 1.0 if 0% to 50%.
- V5 = Number of trees ≥ 20 " dbh per acre.
HSI: 1.0 if ≥ 10 trees per acre.
- V6 = Percent area in optimum food.
HSI: 1.0 if $\geq 70\%$.
- V7 = Percent area in optimum reproduction.
HSI: 1.0 if $\geq 15\%$.
- V8 = Distance between cover types.
HSI: 1.0 if 0.0 to 0.75 mi.

Riparian tree (3 sample sites) and wet pasture (3 sample sites) were the habitat types evaluated. The HSI determination was equal to the lower of the two values obtained for the food and reproductive life requisites.

6. VALLEY QUAIL

V1 = Percent ground vegetation cover.
HSI: 1.0 if between 50% and 75%.

V2 = Average shrub height.
HSI: 1.0 if ≥ 6 ft.

V3 = Distance to escape cover (e.g. dense growth of shrubs or vine tangles)
HSI: 1.0 if ≤ 100 ft.

V4 = Average diameter of escape cover patches.
HSI: 1.0 if between 10-20 ft.

V5 = Distance between escape cover patches.
HSI: 1.0 if between 75-225 ft.

Wet pasture (3 sample sites) and riparian shrub (3 sample sites) habitats were evaluated with this model. The suitability index was based on the cover life requisite.

7. BEAVER

V1 = Percent tree canopy closure.
HSI: 1.0 if between 40% to 60%.

V2 = Percent of trees in the 1-6" dbh size class.
HSI: 0.2 to 1.0 if 0% to 100%.

V3 = Percent shrub crown cover.
HSI: 1.0 if between 40% to 60%.

V4 = Average height of shrub canopy.
HSI: 1.0 if ≥ 6.6 ft.

V5 = Species composition of woody vegetation (trees and/or shrubs).
HSI: 1.0 if woody vegetation dominated ($\geq 50\%$) by one or more of the following species: aspen, willow, cottonwood, or alder; 0.6 if woody vegetation dominated by other deciduous species. 0.2 if woody vegetation dominated by coniferous species (e.g., fir and pine).

V6 = Percent of lacustrine surface dominated by yellow and/or white water lily.
HSI: 0.0 to 0.4 if 0% to 100%.

V7 = Percent stream gradient.
HSI: 1.0 if $\leq 6\%$.

V8 = Average water fluctuation on an annual basis.
HSI: 1.0 if small fluctuations that have no effect on burrow or lodge entrances; 0.5 if moderate fluctuations that affect burrow or lodge entrances; 0.0 if extreme fluctuations or water absent during part of the year.

V9 = Shoreline development factor.
HSI: 1.0 if ≥ 3.0 .

The riparian tree (3 sample sites), riparian shrub (3 sample sites), forested wetland (3 sample sites), emergent wetland (3 sample sites), and open water (3 sample sites) habitat types were evaluated for the beaver. The HSI was equal to the lowest life requisite value obtained for either food or water, based on the limiting factor concept.

8. SPOTTED SANDPIPER

V1 = Nesting cover (a mosaic of herbaceous ground cover with an overall density of less than 50% and less than 2' high; overstory of deciduous trees can be present if ground cover requirements are met).
HSI: 1.0 if between 12.5% to 75%.

V2 = Nesting distance from water.
HSI: 1.0 if ≤ 75 ft.

V3 = Foraging habitat.
1.0 if $\leq 50\%$ organic ground cover (debris or drift).

Shorelines adjacent to the edges of emergent wetland, open water, and riparian tree habitats were sampled for the foraging component. For the reproductive and cover components, the wet pasture and riparian tree habitats were sampled, measuring 150ft from the edge of the water. Three sample sites for each component were evaluated. The model is based on the foraging, cover, and reproductive life requisites.

7 RESULTS AND DISCUSSION

The HSI scores for the evaluation species are displayed in Table 4, page 21. Habitat suitability ranged from 0.10 for the Spotted Sandpiper to 1.0 for the Great Blue Heron and Wood Duck. HSI scores for several species, (Red-tailed Hawk, 1.00 and 0.60; and Beaver, 1.00 and 0.50), were based on the lowest of the two values for the reproduction and food life requisites, and therefore may not reflect all of the present habitat conditions. To obtain an indication of baseline habitat conditions at Burlington Bottoms, the HSI's were converted to HU's for each evaluation species (Table 4).

Average Annual Habitat Unit determinations were made for future habitat conditions, based on the effects of; 1) future habitat without management (which would, at a minimum, include maintaining the baseline habitat conditions); and 2) future habitat with management (which could include enhancement projects such as reestablishing native plant species). Table 5 depicts the net changes in AAHU's between these management options.

WOOD DUCK - The Wood Duck is a common species at Burlington Bottoms. High quality nesting and brood-rearing habitat are available in the wetlands and riparian tree areas, which is reflected in the HSI of 1.00. Optimum brood cover is a combination of downfall and woody and herbaceous emergent plants, well interspersed with small, open water channels. This habitat is present in both the wetlands and along many of the channel areas.

- Future Habitat Without Management: Existing optimal habitat conditions (1.00) would be maintained for the Wood Duck. Control of non-native plant species such as Reed canary grass would ensure that no loss of foraging or cover habitat would occur. Enhancement activities (such as reestablishing native species) would not occur.

- Future Habitat With Management: Eliminating the Reed canary grass in the emergent wetlands, and revegetating those areas with native grasses would maintain existing cover and foraging habitat, and increase the quality and quantity of available food sources. In most areas at Burlington Bottoms, there appears to be a sufficient number of potentially suitable tree cavities for nest sites. Nest boxes could be placed in those areas where suitable cavities are lacking.

TABLE 4. Burlington Bottoms Habitat Evaluation based on suitability for eight selected wildlife species. Results are expressed as Habitat Suitability Indices (HSI) converted to Habitat Units (HU).

Species	Habitat Type	Acres	HSI	HU
1. <u>Wood Duck</u>	riparian tree, open water, emergent wetland, forested wetland	338	1.00	338
2. <u>Great Blue Heron</u>	riparian tree, forested wetland, emergent wetland, open water, wet pasture	388	1.00	388
3. <u>Yellow Warbler</u>	riparian shrub	14	0.77	11
4. <u>Black-capped Chickadee</u>	riparian tree	215	0.88	189
5. <u>Red-tailed Hawk</u>	riparian tree, wet pasture	265	0.60*	159
6. <u>Valley Quail</u>	wet pasture, riparian shrub	64	0.87	56
7. <u>Beaver</u>	riparian tree, open water, riparian shrub, forested wetland, emergent wetland,	352	0.50*	176
8. <u>Spotted Sandpiper</u>	emergent wetland,** open water, riparian tree, wet pasture	23	0.10	2
Total HUs:				1319

*HSI determination was based on the lower of the two HSI values; Red-tailed Hawk, 1.0 for reproduction, 0.60 for the food component; Beaver, 1.0 for winter food, 0.50 for water. See pages 24 - 26 under RESULTS AND DISCUSSION. **The shorelines of lakes, ponds, and channels adjacent to the emergent wetland, open water and riparian tree habitats were sampled for the foraging component; for the cover and reproductive components, sampling occurred in the riparian tree and wet pasture habitats, measuring 0 - 150 ft. from the water's edge.

TABLE 5. Net change in Average Annual Habitat Units (AAHU) for Future Habitat with Management (With Action) versus Future Habitat Without Management (Without Action).

Evaluation No.	Species Name	AAHU's With Action	AAHU's Without Action	Net Change
1.	Wood Duck	338.00	338.00	0.00
2.	Great Blue Heron	388.00	388.00 ✓	0.00
3.	Yellow Warbler	12.41	10.78 ✓	1.63
4.	Black-capped Chickadee	204.10	189.20 ✓	14.90
5.	Red-tailed Hawk	237.57	159.00 ✓	78.57
6.	Valley Quail	60.75	55.68	5.07
7.	Beaver	176.00	176.00 ✓	0.00
8.	Spotted Sandpiper	7.70	2.30 ✓	5.40

GREAT BLUE HERON - The HSI of 1.0 for the Great Blue Heron reflects the high habitat suitability at Burlington Bottoms. A small, active heronry was located and verified in 1992 and 1993. Burlington Bottoms also offers other potential nest sites for herons. The extensive wetland system, an abundance of prey, and lack of disturbance from human activities all contribute to optimum habitat conditions for the Heron and other species of wading birds. These conditions are also optimal for such species as the Western painted turtle, which has been observed at Burlington Bottoms.

- **Future Habitat Without Management:** The existing 388 ac of optimal habitat would be maintained for the Great Blue Heron. Since there would be no enhancement activities, an improvement in habitat conditions for other species, such as the Western pond turtle, would not occur. The extreme density and height of the Reed canary grass in the wetlands and wet pasture areas make movement difficult if not impossible for the turtle and other wildlife species.

- **Future Habitat With Management:** Control and/or elimination of non-native plant species would prevent the loss of foraging and hiding cover for such species as the Great Blue Heron. Enhancement activities, such as reestablishing native grasses in the wet pasture and wetlands areas, would improve habitat conditions for many wildlife species. With management, regulation of human activities would occur. This would decrease the potential for human disturbance to the Great Blue Heron, and other wildlife species found at Burlington Bottoms.

YELLOW WARBLER - The Yellow Warbler is a common species at Burlington Bottoms. Most of the 14.10 acres of riparian shrub provide optimal habitat conditions, with dense, moderately tall stands of hydrophytic deciduous shrubs. The HSI value of 0.77 reflects the relatively high habitat suitability for the Warbler and other wildlife species which use the riparian shrub habitat.

- **Future Habitat Without Management:** Non-native plant species, such as blackberry and Scot's broom, are rapidly encroaching into much of the riparian shrub habitat, and are able to outcompete important native plants such as willows, snowberry and red elderberry. Maintaining the baseline habitat conditions, which would include controlling the spread of non-native plant species, would ensure that the value of the riparian shrub habitat does not decrease for the Yellow Warbler and other wildlife species that use this habitat type.

- **Future Habitat With Management:** Management activities such as control and/or eradication of non-native plant species would improve and increase the available habitat for the Yellow Warbler, and other species that use the riparian shrub habitat.

BLACK-CAPPED CHICKADEE - The HSI of 0.88 reflects the optimum conditions in the 215 acres of riparian tree habitat, to meet the food and reproductive needs (2 snags per acre, with a d.b.h. of 4-10"; canopy closures between 50-75%; and overstory trees 49' 2" or more in height) of the Black-capped Chickadee and other cavity nesters.

- **Future Habitat Without Management:** The riparian tree habitat is well distributed throughout Burlington Bottoms, and appears to be expanding into the wet pasture areas due to natural plant succession. Evidence of this is apparent when comparing historical photos (from the 1930's - 1980's) to those taken in March of 1993. Without management, the amount of riparian tree habitat is likely to increase over time. This would benefit the Black-capped Chickadee, but would not necessarily be beneficial to species using the wet pasture areas.

- **Future Habitat With Management:** Present habitat conditions are at optimal for the Black-capped Chickadee and should continue to be so for the long term. Future management options should consider methods which prevent the riparian tree habitat from expanding into the open areas to prevent loss of habitat for other wildlife species.

RED-TAILED HAWK - High quality habitat for the Red-tailed Hawk includes a sufficient number of perches from which to hunt, open grassy areas, and mature trees which provide sites for nest locations. The interspersation of these habitat components is important, and the model assumes that the best habitat for the Red-tailed Hawk contains high quality food over 70 percent of the habitat, and high quality reproductive habitat over 15 percent of the area.

The HSI values obtained for the Red-tailed Hawk model were 0.60 for the food component, and 1.00 for the reproductive value; the final HSI was 0.60 based on the lower of the two scores. This value (0.60) indicates conditions were below optimum for the food component in the wet pasture habitat. The herbaceous canopy requirement is present, but is far above the required 3-18" height due to the presence of Reed canary grass (over 2' in height) in all of the wet pasture habitat. It is assumed in the model that this condition severely limits prey accessibility.

- Future Habitat Without Management: The wet pasture areas used for foraging by the Red-tailed Hawk are composed primarily of dense, high stands of Reed canary grass and may limit hunting ability. Maintaining the baseline habitat conditions would maintain but not improve the quality of the foraging areas for the Red-tailed Hawk, and other species that use this habitat.

- Future Habitat With Management: Control and/or eradication of Reed canary grass, and reestablishment of native grasses in the wet pasture habitat, would improve the quality of the foraging component for the Red-tailed Hawk. The herbaceous canopy component, which presently exceeds the required 3-18" height, could be at optimum with management, thus increasing prey availability.

VALLEY QUAIL - Optimal habitat conditions for the Valley Quail consist of a high degree of interspersion of herbaceous and woody cover and water sources within a small area. The HSI of 0.84 is an indication of the relatively high habitat suitability for this species. Cover requirements in most of the areas sampled were at optimal levels. However, the herbaceous vegetation in the wet pasture habitat is high (> 2ft in two of three areas sampled), and dense, and is a limiting component of the 50 acres of pasture habitat. Optimum ground vegetation cover ranges from 50 - 75 percent for Valley Quail. In two areas sampled, it was 100 percent.

- Future Habitat Without Management: Since baseline habitat conditions would be maintained, the overall suitability of the habitat for the Valley Quail would stay relatively high. Without enhancement activities, however, the herbaceous vegetative component in the wet pasture areas would remain higher than desired, and could impede movement of the Valley Quail and other species that require vegetation < 2ft tall.

- Future Habitat With Management: Enhancement activities would improve habitat conditions for the Valley Quail, and increase the quantity and quality of available habitat. Removal of non-native plant species and reestablishment of native species could increase the HSI from 0.87 to 1.00.

BEAVER - The HSI for the Beaver (0.5) was based on a "limiting factor concept"; in this case the HSI was equal to the lowest life requisite value obtained for either food (1.0) or water (0.5). In the Beaver model, optimum conditions for the water component of Beaver habitat (in all wetland cover types) require little or no fluctuation in water levels on an annual basis, in order to have a minimum impact on burrow or lodge entrances. Data collected to date at Burlington Bottoms reflects what is considered a "moderate" fluctuation, thus receiving the suitability index of 0.50. Despite the indication from the HSI that the wetland habitat types are only moderately suitable, at the present time there appears to be an active beaver population at Burlington Bottoms. Several lodges are located at the edge of largest of the lakes. Beaver dams present on the main channel and at the south end of Horseshoe Lake, exert considerable influence on the water levels.

The HSI of 1.0 for the winter food component is an indication of the high quality riparian tree, riparian shrub, emergent wetland, and open water cover types for the beaver and other species such as mink. The distribution of these habitats offers an accessible and adequate supply of food, which includes riparian shrub species (willows), and herbaceous and aquatic vegetation.

- **Future Habitat Without Management:** Habitat conditions at present support an active beaver population. These habitat conditions are not expected to change over the long-term without management. Due to the limiting factor concept of the beaver model, the HSI would remain at 0.50 without management.

- **Future Habitat With Management:** Continual monitoring of the beaver population will be important in assessing the quality of the various habitat types. Control or removal of non-native plant species such as Reed canary grass, will improve the quality of the wetland habitat. Due to the limiting factor concept of the beaver model, and the expected continuing moderate fluctuation in water levels, the HSI would remain at 0.50.

SPOTTED SANDPIPER - The HSI of 0.10 for the Spotted Sandpiper reflects the marginal conditions of the available habitat. The nesting cover requirements (mosaic of herbaceous ground cover with an overall density of less than 50 percent and less than 2ft high) were not met. Reed canary grass was present in all areas sampled, and was well over 2ft high and quite dense.

A small amount of foraging habitat (open or sparsely vegetated shorelines within 150 feet of water) was present in two of the areas sampled but was of very low quality. The open shorelines sampled along the channels are probably due to beaver and river otter activity in the area, combined with water fluctuations.

Open, muddy areas are present along portions of the shorelines of the ponds and lakes, usually in late summer. Historical aerial photos indicate that some of the smaller ponds dry up periodically, exposing muddy banks along the shorelines and into the interiors of the ponds.

- **Future Habitat Without Management:** Since baseline habitat conditions would be maintained, habitat conditions for the Spotted Sandpiper would remain marginal. It is unlikely that the amount of habitat available would increase over time without enhancement of the native plant communities, and control or removal of the non-native plant species. The presence of Reed canary grass in most areas creates conditions unsuitable for nesting and foraging for the Spotted Sandpiper and other species of shorebirds.

- **Future Habitat With Management:** Control or eradication of Reed canary grass and other non-native species, and enhancement of native plant communities, may in some areas increase the quantity and quality of foraging and/or nesting habitat. This increase in quality would result in a higher HSI value, and an improvement in the overall habitat conditions for the Spotted Sandpiper and other species of shorebirds.

7.1 Additional Species

Though HSIs were not determined for these species, calculations were made for the # of acres of suitable habitat at Burlington Bottoms for the following species; 1) Black-tailed Deer, uses all habitat types minus 90% of the open water, for a total of 390 ac; 2) Mink, uses open water and emergent wetland, 107 ac; and 3) Canada Goose, uses open water, emergent wetland, and forested wetland, for a total of approximately 123 ac. These species are Target Species for the Bonneville Dam Project in the lower Columbia River Basin.

7.2 AAHU's and Future Habitat

Table 5 depicts the net changes in AAHU's, comparing the future habitat conditions with management to future habitat conditions without management (maintaining baseline habitat conditions). The optimal habitat conditions for the Wood Duck and Great Blue Heron would be maintained under both management scenarios, resulting in no net change in AAHU's. Due to the limiting factor concept of the beaver model, no net change in AAHU's would occur under either management scenario.

With management, an improvement in habitat conditions would occur for the Yellow Warbler, Black-capped Chickadee, Red-tailed Hawk, Valley Quail, and Spotted Sandpiper, resulting in an increase in AAHU's for all of these species. The largest increase would be for the Red-tailed Hawk, with a net change of 78.57 AAHU's.

8 SUMMARY

Burlington Bottoms provides optimal habitat conditions for many wildlife species including the Great Blue Heron, Wood Duck, Black-capped Chickadee, Yellow Warbler, and Valley Quail. The HSI scores for the beaver and Red-tailed Hawk indicate that overall habitat conditions for these species are moderately suitable. However, since both models were based on the "limiting factor concept", these scores do not adequately reflect the existing habitat conditions. HSI scores were at optimum for the food component of the beaver model and the reproduction component of the Red-tailed Hawk model. Breeding populations of both the beaver and Red-tailed Hawk occur at Burlington Bottoms.

HSI scores for the Spotted Sandpiper indicated marginal habitat conditions. This is due in part to the rapid advancement of non-native plants such as Reed canary grass along the banks of the lakes, ponds, and channels, and in the wet pasture and emergent wetland habitats. Few areas presently exist that provide high quality foraging or nesting sites for shorebirds.

Maintaining the baseline habitat conditions at Burlington Bottoms will ensure that mitigation goals for the Columbia River Basin Fish and Wildlife Program and Amendments are met. However, without future management, it is unlikely that habitat conditions will improve for species such as the Spotted Sandpiper. Future management considerations should include controlling human access to the area in order to reduce and/or eliminate the potential for human disturbance to native wildlife and plant populations. With management, including enhancement of native plant communities, habitat conditions can be improved for many wildlife species.

9 REFERENCES

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10 APPENDICES

**APPENDIX A. Fish and Wildlife Species at Burlington
Bottoms**

APPENDIX B. Plant Species at Burlington Bottoms

APPENDIX A
FISH AND WILDLIFE SPECIES AT BURLINGTON BOTTOMS

10/93

BIRDS OF BURLINGTON BOTOMS

KNOWN OR BELIEVED TO BE PRESENT

LOONS, GREBES

	<i>Sp</i>	<i>Su</i>	<i>F</i>	<i>W</i>	<i>N</i>
Red-throated Loon.....	u		u	u	
Pacific Loon.....			r	r	
Common Loon.....				r	
Pied-billed Grebe.....	u	u	u	u	*
Horned Grebe.....	r			u	
Red-necked Grebe.....	r			r	
Eared Grebe.....	r			r	
Western Grebe.....				u	
Clark's Grebe.....			u		

CORMORANTS

	<i>Sp</i>	<i>Su</i>	<i>F</i>	<i>W</i>	<i>N</i>
Double-crested Cormorant.....	u	u	c	c	

SWANS, DUCKS, GEESE

	<i>Sp</i>	<i>Su</i>	<i>F</i>	<i>W</i>	<i>N</i>
Tundra Swan.....	r	r	r	r	
Trumpeter Swan.....	r			r	
Greater White-fronted Goose.....	u	r	u	u	
Snow Goose.....		r	u		
Ross' Goose.....			r	r	
Emperor Goose.....				r	
Brant.....	r		r	r	
Canada Goose.....	a	c	a	a	*
Wood Duck.....	c	c	c	c	*
Green-winged Teal.....	c	u	c	c	
American Black Duck....				r	
Mallard.....	a	c	a	a	*
Northern Pintail.....	a	u	a	a	
Blue-winged Teal.....	u	u	c	r	
Cinnamon Teal.....	c	c	c	r	*
Northern Shoveler.....	c	u	c	c	*
Gadwall.....	r	r	u	u	
Eurasian Wigeon.....	u		u	u	
American Wigeon.....	a	r	a	a	
Canvasback.....			u	u	
Redhead.....				r	
Ring-necked Duck.....	u	r	u	u	
Greater Scaup.....			r	r	
Lesser Scaup.....	r	r	r	u	

	<i>Sp</i>	<i>Su</i>	<i>F</i>	<i>W</i>	<i>N</i>
Black Scoter.....				r	
Surf Scoter.....			r	r	
White-winged Scoter....			r	r	
Common Goldeneye.....	r		r	r	
Barrow's Goldeneye.....				r	
Bufflehead.....	r	r	c	c	
Hooded Merganser.....	u	u	u	u	*
Common Merganser.....	u	u	c	c	
Red-breasted Merganser.				r	
Ruddy Duck.....	u		u	u	*
Oldsquaw.....			r		

GULLS, TERNS, PELICANS

	<i>Sp</i>	<i>Su</i>	<i>F</i>	<i>W</i>	<i>N</i>
Parasitic Jaeger.....			r		
Franklin's Gull.....	r	r	r	r	
Bonaparte's Gull.....	u	r	u	u	
Mew Gull.....	u		c	a	
Ring-billed Gull.....	c	c	a	a	
California Gull.....	u	c	c	c	
Herring Gull.....	u		u	u	
Thayer's Gull.....	u		u	u	
Western Gull.....			r	r	
Glaucous-winged Gull...	u	u	c	a	
Glaucous Gull.....	r		r	r	
Caspian Tern.....	r	u	u		
Common Tern.....		r	r		
Forster's Tern.....			r		
Black Tern.....	r				
American White Pelican.		r	r		
Brown Pelican.....	r	r	r		

HERONS, BITTERNS IBIS

	<i>Sp</i>	<i>Su</i>	<i>F</i>	<i>W</i>	<i>N</i>
Great Blue Heron.....	c	c	c	c	*
Green-backed Heron.....	u	u	r	r	*
Black-crowned Night Heron.....	r	r	r	r	
American Bittern.....	u	u	r	r	
Great Egret.....	r	r	u	r	
Snowy Egret.....			r		
Cattle Egret.....			r	r	
White-faced Ibis.....				r	

Sp = Mar-May *F* = Sept-Nov *N* = Nests Locally*
Su = Jun-Aug *W* = Dec-Feb

a = Abundant *u* = Uncommon *ac* = Accidental
c = Common *r* = Rare

BIRDS OF BURLINGTON BOTTOMS

KNOWN OR BELIEVED TO BE PRESENT

STORKS, CRANES *Sp Su F W N*

Wood Stork..... ac
Sandhill Crane..... c r c u

RAILS, COOT *Sp Su F W N*

Virginia Rail..... c c c u *
Sora..... c c c *
American Coot..... u u c c *

SHOREBIRDS *Sp Su F W N*

Black-bellied Plover... u r
Lesser Golden Plover... u
Semipalmated Plover... u u
Spotted Sandpiper..... u u u u *
Killdeer..... c c c c *
American Avocet..... u c c r
Greater Yellowlegs..... u c c r
Lesser Yellowlegs..... r u u r
Solitary Sandpiper..... u u u r
Whimbrel..... r r r
Long-billed Curlew..... r
Marbled Godwit..... r r
Sanderling..... r r r
Semipalmated Sandpiper. r r r
Western Sandpiper..... c c a r
Least Sandpiper..... c c c u
Bairds Sandpiper..... r r u
Pectoral Sandpiper..... r u
Sharp-tailed Sandpiper. ac
Buff-breasted Sandpiper..... r r
Short-billed Dowitcher. r r
Long-billed Dowitcher.. u c c r
Common Snipe..... u r u u
Wilson's Phalarope..... r r r
Red-necked Phalarope... r u
Red Phalarope..... r r

GROUSE, PHEASANT, *Sp Su F W N*

Ruffed Grouse..... u u u u *
Ring-necked Pheasant... c c c c *
Northern Bobwhite..... u u u u *
California Quail..... c c c c *

HAWKS, EAGLES, VULTURE *Sp Su F W N*

Northern Harrier..... c u c c *
Sharp-shinned Hawk..... u u u u *
Cooper's Hawk..... u u u u *
Northern Goshawk..... r
Red-shouldered Hawk.... r r
Swainson's Hawk..... r r
Red-tailed Hawk..... c c c c *
Ferruginous Hawk..... r r
Rough-legged Hawk..... u u u
Bald Eagle..... u r u c *
Golden Eagle..... r
Turkey Vulture..... c c c
Osprey..... u u u r
Black-shouldered Kite.. r r r
American Kestrel..... c c c c *
Merlin..... r r r
Peregrine Falcon..... r r r
Gyr Falcon..... r
Prairie Falcon..... r

OWLS *Sp Su F W N*

Barn Owl..... c c c c *
Northern Pygmy Owl..... u u u u *
Western Screech Owl.... u u u u *
Great Horned Owl..... c c c c *
Snowy Owl..... ac
Long-eared Owl..... r r r r
Short-eared Owl..... r r u u
Northern Saw-whet Owl.. u u u u *

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F = Sept-Nov
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N = Nests Locally*

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ac = Accidental

BIRDS OF BURLINGTON BOTTOMS

KNOWN OR BELIEVED TO BE PRESENT

KINGFISHER Sp Su F W N

Belted Kingfisher..... c c c c *

PIGEONS, DOVES Sp Su F W N

Band-tailed Pigeon..... u u u r

Rock Dove..... c c c c *

Mourning Dove..... c c c c *

NIGHTHAWK, HUMMINGBIRD Sp Su F W N

Common Nighthawk..... r r

Anna's Hummingbird..... r r r r

Rufous Hummingbird..... u c c *

SWIFTS Sp Su F W N

Vaux's Swift..... u u *

WOODPECKERS Sp Su F W N

Lewis Woodpecker..... r r

Acorn Woodpecker..... r r

Red-breasted Sapsucker. r r r r *

Downy Woodpecker..... c c c c *

Hairy Woodpecker..... u u u u *

Northern Flicker..... c c c c *

Pileated Woodpecker.... u u u u *

FLYCATCHERS, SWALLOWS Sp Su F W N

Olive-sided Flycatcher. u u

Western Wood Pewee..... u c *

Willow Flycatcher..... u u u *

Hammond's Flycatcher... r

Dusky Flycatcher..... r

Pacific Slope

Flycatcher..... u u u *

Say's Phoebe..... r

Western Kingbird..... r r r *

Purple Martin..... u u u *

Tree Swallow..... a a c u *

Sp Su F W N

Violet-green Swallow... a a c u *

Northern Rough-winged

Swallow..... u r u *

Bank Swallow..... r r r

Cliff Swallow..... a a u *

Barn Swallow..... a a a *

LARKS Sp Su F W N

Horned Lark..... r r r

JAYS, CROWS Sp Su F W N

Steller's Jay..... u u u u *

Scrub Jay..... c c c c *

Black-billed Magpie.... r r

American Crow..... a c c a *

Common Raven..... r

CHICKADEES, BUSHTIT Sp Su F W N

Black-capped Chickadee. c c c c *

Mountain Chickadee..... r

Chestnut-backed

Chickadee..... u u u u

Bushtit..... c c c c *

NUTHATCHES Sp Su F W N

Red-breasted Nuthatch.. u u u u *

White-breasted

Nuthatch..... c c c c *

Brown Creeper..... u u u u

WRENS Sp Su F W N

Bewick's Wren..... c c c c *

House Wren..... c c c *

Winter Wren..... u u u

Marsh Wren..... c c u u *

Sp = Mar-May F = Sept-Nov N = Nests Locally*
Su = Jun-Aug W = Dec-Feb

a = Abundant u = Uncommon ac = Accidental
c = Common r = Rare

BIRDS OF BURLINGTON BOTTOMS

KNOWN OR BELIEVED TO BE PRESENT

KINGLETS Sp Su F W N

Golden-crowned Kinglet. r r c c *
 Ruby-crowned Kinglet... c r c c

THRUSHES Sp Su F W N

Western Bluebird..... r r r
 Swainson's Thrush..... u c c *
 Hermit Thrush..... u u u
 American Robin..... a a c c *
 Varied Thrush..... u u u

PIPIT, WAXWING Sp Su F W N

American Pipit..... u a r
 Cedar Waxwing..... u u u u

SHRIKES, STARLING Sp Su F W N

Northern Shrike..... r r
 Loggerhead Shrike..... r r
 European Starling..... a a a a *

VIREOS Sp Su F W N

Solitary Vireo..... u u
 Hutton's Vireo..... r r r r *
 Warbling Vireo..... c c c
 Red-eyed Vireo..... u u u *

WOOD WARBLERS Sp Su F W N

Orange-crowned Warbler. c c u u *
 Nashville Warbler..... u r u
 Yellow Warbler..... u u u *
 Yellow-rumped Warbler.. a u c u *
 Black-throated Gray
 Warbler..... c u c
 Townsend's Warbler..... u u u r
 MacGillivray's Warbler. u u u *
 Common Yellowthroat.... c c u *

_____ Sp Su F W N

Wilson's Warbler..... c c u *
 Yellow-breasted Chat... r r *

TANAGER, GROSBEAKS Sp Su F W N

Western Tanager..... u u
 Black-headed Grosbeak.. c c u *

BLACKBIRDS, ORIOLES Sp Su F W N

Red-winged Blackbird... c c a a *
 Tricolored Blackbird... r r r r
 Western Meadowlark..... u u u u
 Yellow-headed
 Blackbird..... u u r r *
 Rusty Blackbird..... r
 Brewer's Blackbird..... c c c c *
 Brown-headed Cowbird... c c c u *
 Northern Oriole..... c c r *

TOWHEE, SPARROWS Sp Su F W N

Rufous-sided Towhee.... c c c c *
 Chipping Sparrow..... r u r r *
 Clay-colored Sparrow... r
 Vesper Sparrow..... r r r r
 Lark Sparrow..... r r
 Tree Sparrow..... c c c r *
 Savannah Sparrow..... c c c r *
 Fox Sparrow..... r u r
 Song Sparrow..... c c c c *
 Lincoln Sparrow..... u u u
 Swamp Sparrow..... r r r
 White-throated Sparrow. r r r
 Golden-crowned
 Sparrow..... c c a
 White-crowned
 Sparrow..... u u u c *
 Harris Sparrow..... r r
 Dark-eyed Junco..... u r c c *
 Lapland Longspur..... r r

Sp = Mar-May F = Sept-Nov N = Nests Locally*
 Su = Jun-Aug W = Dec-Feb

a = Abundant u = Uncommon ac = Accidental
 c = Common r = Rare

BIRDS OF BURLINGTON BOTTOMS

KNOWN OR BELIEVED TO BE PRESENT

FINCHES, WEAVER FINCH *Sp Su F W N*

Purple Finch.....	u	u	u	u	*
House Finch.....	c	c	c	c	*
Pine Siskin.....	u	u	u	u	
Lesser Goldfinch.....	r	r			

Sp Su F W N

American Goldfinch.....	c	c	a	c	*
Evening Grosbeak.....	r		r		
Red Crossbill.....			r	r	
House Sparrow.....	c	c	c	c	*

Sp = Mar-May
Su = Jun-Aug

F = Sept-Nov
W = Dec-Feb

N = Nests Locally*

a = Abundant
c = Common

u = Uncommon
r = Rare

ac = Accidental

FISH OF BURLINGTON BOTTOMS

KNOWN OR BELIEVED TO BE PRESENT

WARMWATER FISH

White crappie
Black crappie
Brown bullhead
Yellow bullhead
Black bullhead
Channel catfish
Yellow perch
Large mouth bass
Smallmouth bass
Bluegill
Pumpkinseed
sunfish
Common Carp
Goldfish
Warmouth
Gambusia
Chiselmouth
Peamouth
Northern squawfish
Longnose dace
Redside shiner

COLDWATER FISH

Cottid
American shad
Peamouth
Largescale sucker
Mountain sucker
Walleye
Chiselmouth
Stickleback
Sturgeon
Western brook
lamprey
Pacific lamprey
Coho salmon
Chinook salmon
Sockeye salmon
Rainbow trout
Cutthroat trout
Steelhead trout
Kokanee
Prickley sculpin
Reticulate sculpin
Mountain whitefish
Sand roller

MARINE FISH

Starry flounder

REPTILES AND AMPHIBIANS OF BURLINGTON BOTTOMS

KNOWN OR BELIEVED TO BE PRESENT

REPTILES	C	U	R	T&E	SS	AMPHIBIANS	C	U	R	T&E	SS
Western pond turtle...			x		x	Pacific tree frog.....	x				
Western painted turtle.....	x				x	Red-legged frog.....		x			x
Western fence lizard..		x				Western toad.....			x		
Northern alligator lizard.....		x				Bullfrog.....	x				
Western skink.....		x				Northwestern salamander.....		x			
Rubber boa.....		x				Western red-backed salamander.....		x			
Ringneck snake.....		x				Long-toed salamander..	x				
Racer.....		x				Ensatina.....	x				
Gopher snake.....		x				Dunn salamander.....		x			
Common garter snake... x						Clouded salamander....			x		x
Northwestern garter snake.....	x					Rough-skinned newt....	x				
Western terrestrial garter snake.....	x										

C = Common

U = Uncommon

R = Rare

T&E = Threatened & Endangered

SS = State sensitive

MAMMALS OF BURLINGTON BOTTOMS

KNOWN OR BELIEVED TO BE PRESENT

OPOSSUM C U R T&E SS

Opossum..... x

SHREWS C U R T&E SS

Dusky shrew..... x
Trowbridge shrew..... x
Vagrant shrew..... x
Pacific water shrew... x

MOLES C U R T&E SS

Shrew-mole..... x
Townsend mole..... x
Pacific mole..... x

BATS C U R T&E SS

Little brown myotis... x
Fringed myotis..... x
California myotis..... x
Yuma myotis..... x
Long-eared myotis..... x
Silver-haired bat..... x
Red bat..... x
Big brown bat..... x
Hoary bat..... x
Western big-eared bat..... x
bat..... x

CARNIVORES C U R T&E SS

Black bear..... x
Raccoon..... x
Shorttail weasel..... x
Longtail weasel..... x
Mink..... x
River otter..... x
Spotted skunk..... x
Striped skunk..... x

CARNIVORES C U R T&E SS

Red fox..... x
Grey fox..... x
Mountain lion..... x
Bobcat..... x
California sea lion... x
Harbor seal..... x
Coyote..... x

RODENTS C U R T&E SS

California ground squirrel..... x
Townsend's chipmunk... x
Chickaree..... x
Fox squirrel..... x
Northern flying squirrel..... x
Bushytail woodrat..... x
Dusky footed woodrat.. x
Deer mouse..... x
Townsend vole..... x
Longtail vole..... x
Oregon vole..... x
Pacific jumping mouse. x
House mouse..... x
Norway rat..... x
Black rat..... x
Brush rabbit..... x
Blacktail jackrabbit.. x
Eastern cottontail.... x
Beaver..... x
Muskrat..... x
Nutria..... x
Porcupine..... x

CERVIDS C U R T&E SS

Black-tailed deer..... x
Elk..... x

C = Common

U = Uncommon

R = Rare

T&E = Threatened & Endangered

SS = State sensitive

APPENDIX B

PLANT SPECIES AT BURLINGTON BOTTOMS

Appendix B

Plants of Burlington Bottoms Natural Area,
Multnomah County, Oregon

Oregon Natural Heritage Program

LAKES, POOLS AND PONDS - emergent marsh and aquatic beds

Herbs

<i>Callitriche heterophylla</i>	Different-leaved water-starwort
<i>Callitriche stagnalis</i>	Pond water-starwort
<i>Ceratophyllum demersum</i>	Coontail
<i>Elodea canadensis</i>	Canadian waterweed
<i>Gratiola neglecta</i>	American hedge-hyssop
<i>Lemna minor</i>	Duckweed
<i>Ludwigia palustris</i>	Water purslane
<i>Myriophyllum hippuroides</i>	Western water-milfoil
<i>Myriophyllum spicatum</i>	Spiked water-milfoil
<i>Navarretia</i> sp.	Navarretia
<i>Polygonum amphibium</i>	Water smartweed
<i>Polygonum hydropiperoides</i>	Waterpepper
<i>Potamogeton epihydrus</i>	Ribbon-leaf pondweed
<i>Potamogeton crispus</i>	Curled pondweed
<i>Potamogeton pectinatus</i>	Fennel-leaved pondweed
<i>Sagittaria latifolia</i>	Wapato
<i>Sparganium emersum</i>	Simplestem bur-reed
<i>Spirodela polyrhiza</i>	Great duckweed
<i>Typha latifolia</i>	Broad-leaved cattail

Grasses and sedges

<i>Cyperus erythrorhizos</i>	Red-rooted flatsedge
<i>Eleocharis ovata</i>	Ovoid spikerush
<i>Eleocharis palustris</i>	Creeping spikerush
<i>Glyceria borealis</i>	Northern mannagrass
<i>Juncus bufonius</i>	Toad rush
<i>Juncus effusus</i>	Soft rush
<i>Juncus oxymers</i>	Pointed rush
<i>Juncus tenuis</i>	Slender rush
<i>Phalaris arundinacea</i>	Reed canary grass

SEASONALLY WET PASTURE

Shrubs

Rubus discolor

Himalayan blackberry

Herbs

Chrysanthemum leucanthemum

Oxe-eye daisy

Cirsium arvense

Canada thistle

Cirsium vulgare

Bull thistle

Geum macrophyllum

Broad-leaved avens

Grasses and sedges

Alopecurus aequalis

Shortawn foxtail

Alopecurus pratensis

Meadow foxtail

Anthoxanthum odoratum

Sweet vernal grass

Carex sp.

Sedge

Carex aperta

Columbia sedge

Festuca arundinacea

Tall fescue

Holcus lanatus

Velvet grass

Hordeum brachyantherum

Meadow barley

Phalaris arundinacea

Reed canary grass

BOTTOMLAND/RIPARIAN FOREST AND SHRUB-SWAMP

Trees

Alnus rubra

Red alder

Fraxinus latifolia

Oregon ash

Populus trichocarpa

Black cottonwood

Shrubs

Cornus stolonifera

Creek dogwood

Crataegus douglasii

Douglas hawthorn

Pyrus fusca

Crabapple

Rhamnus purshiana

Cascara

Ribes sp.

Gooseberry

Rosa nutkana

Nootka rose

Rubus discolor

Himalayan blackberry

Rubus parviflorus

Thimbleberry

Rubus ursinus

Trailing blackberry

Salix lasiandra

Pacific willow

Salix sitchensis

Sitka willow

Sambucus racemosa

Red elderberry

Spiraea douglasii

Douglas spiraea

Symphoricarpos albus

Snowberry

Herbs and ferns

Aruncus sylvester
Athyrium filix-femina
Bidens frondosa
Equisetum arvense
Galium aparine
Glecoma hederacea
Impatiens capensis
Lysimachia nummularia
Polypodium glycyrrhiza
Polystichum munitum
Ranunculus repens
Rumex occidentalis
Solanum dulcamara
Tellima grandiflora
Urtica dioica

Goatsbeard
Lady fern
Beggars tick
Common horsetail
Bedstraw
Ground ivy
Jewelweed
Moneywort
Licorice fern
Sword fern
Creeping buttercup
Western dock
Bittersweet nightshade
Fringe-cup
Stinging nettle

Grasses and sedges

Carex deweyana
Phalaris arundinacea

Dewey's sedge
Reed canary grass

UPLANDS - wooded margins and disturbed areas

Trees

Acer macrophyllum
Fraxinus latifolia
Prunus sp.
Prunus sp.
Prunus emarginata
Quercus garryana

Bigleaf maple
Oregon ash
Cherry (cultivar)
Plum (cultivar)
Bitter cherry
Oregon white oak

Shrubs

Corylus sp.
Crataegus douglasii
Cytisus scoparius
Holodiscus discolor
Rosa multiflora
Rubus discolor
Salix scouleriana

Filbert (cultivar)
Douglas hawthorn
Scots broom
Ocean spray
Multiflora rose
Himalayan blackberry
Scouler willow

Herbs and ferns

Artemisia douglasiana
Barbarea orthoceras
Borago officinalis
Cerastium arvense
Chrysanthemum leucanthemum

Douglas sagewort
American wintercress
Borage
Chickweed
Oxe-eye daisy

Cirsium arvense
Cirsium vulgare
Conium maculatum
Convolvulus sepium
Crepis sp.
Daucus carota
Digitalis purpurea
Epilobium watsonii
Equisetum telmateia
Galium aparine
Geranium molle
Hypericum perforatum
Hypochaeris radicata
Lactuca serriola
Lapsana communis
Lotus corniculatus
Medicago lupulina
Plantago major
Pteridium aquilinum
Rumex acetosella
Rumex crispus
Senecio jacobea
Sherardia arvensis
Solidago canadensis
Tanacetum vulgare
Trifolium arvense
Vicia villosa

Canada thistle
Bull thistle
Poison hemlock
Bindweed
Hawksbeard
Wild carrot
Foxglove
Watson's willow-herb
Giant horsetail
Bedstraw
Dovefoot geranium
St. Johnswort
False dandelion
Prickly lettuce
Nipplewort
Bird-foot trefoil
Black medic
Common plantain
Bracken fern
Sheep sorrel
Curly dock
Tansy ragwort
Blue field-madder
Goldenrod
Tansy
Hare's-foot
Hairy vetch

Grasses and sedges

Agropyron repens
Aira caryophyllea
Agrostis sp.
Alopecurus pratensis
Anthoxanthum odoratum
Bromus mollis
Bromus rigidus
Festuca arundinacea
Holcus lanatus
Phalaris arundinacea

Quack grass
Silver hairgrass
Bentgrass
Meadow foxtail
Sweet vernal grass
Soft brome
Ripgut
Tall fescue
Velvet grass
Reed canary grass